Mosquito (Diptera: Culicidae) biomass in interior Alaska: No sign of decline 2003-2018

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Introduction

- Insects are vital to ecosystems

  Global Declines in Insect Biomass:

  - Seasonal decline of 76% in flying insect biomass over 27 years in Germany (Hallman et al. 2017).

  - Muscid abundance at Greenland field site declined 80% over 18 years (Loboda et al. 2018)

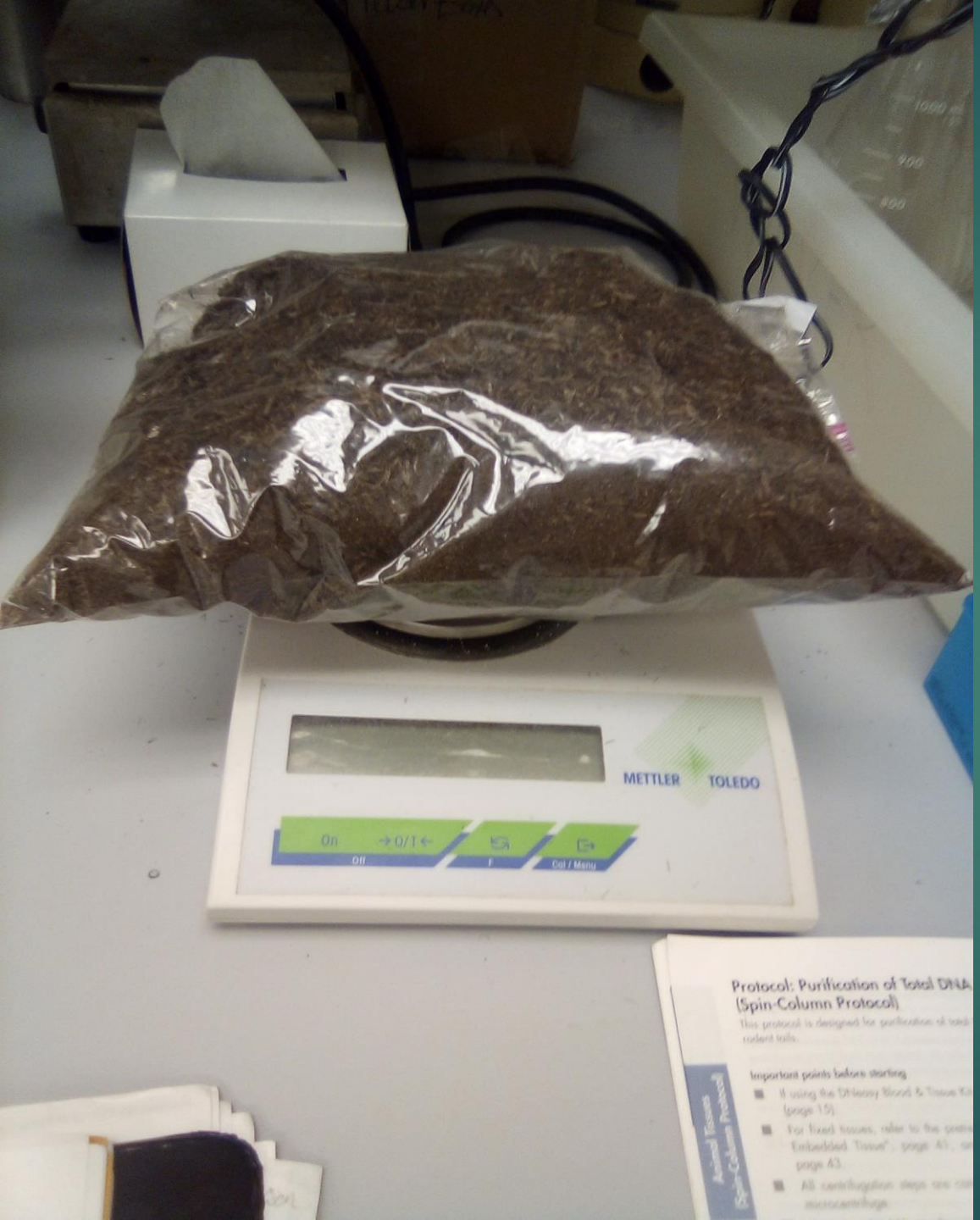
  - Are similar declines in flying insects occurring in interior Alaska?
    - Current data

Methods

- Gary Newman, a citizen Scientist of Fairbanks, donated 11 annual catches of his Mosquito Magnet CO^2 traps
  - Seasonally from first sighting to decline
  - 1083 Esro Rd, Fairbanks (64.907039°N, 147.482958°W [WGS84])
  - Boreal forest/wetland habitat
- Each year stored in plastic gallon bags
  - Bag variance
- Bag weight:
  - Initial, new bags and dry
  - Dried for 48hrs at 55 °C

Year	Weight (initial)	Weight (2nd: bags)	Weight (3rd: dry)
2003	21.42	18.66	18.19
2004	51.3	48.92	47.11
2006	46.99	45.54	43.93
2011	30.47	26.24	25.25
2012	49.46	45.8	43.54
2013	82.36	77.53	72.93
2014	119.11	114.01	109.71
2015	56.39	51.57	48.1
2016	33.02	30.67	29.25
2017	30.63	29.22	28.06
2018	32.39	29.06	28

Table 1. Observed weights of culicids during three processing stages (Units: grams).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Important points before starting

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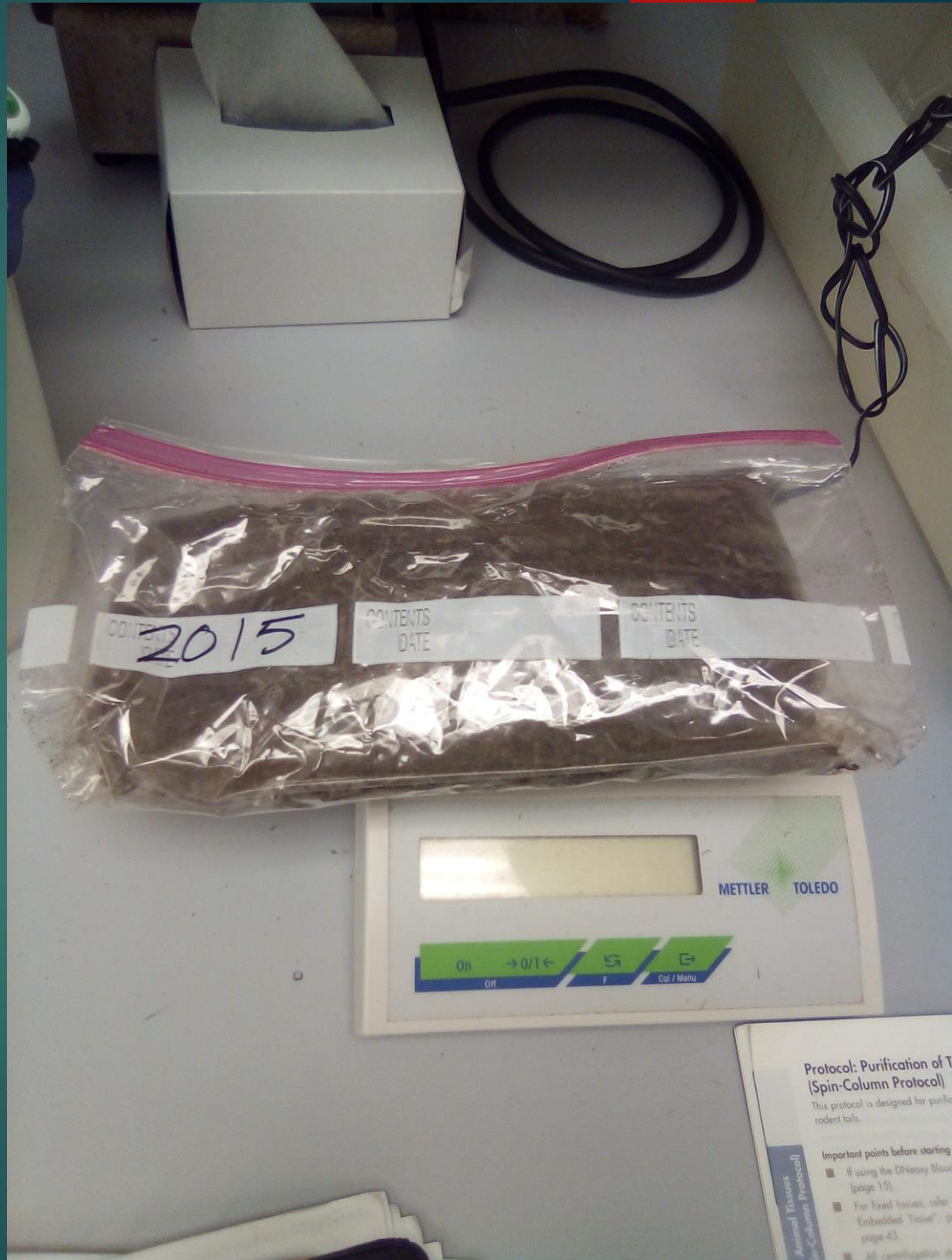
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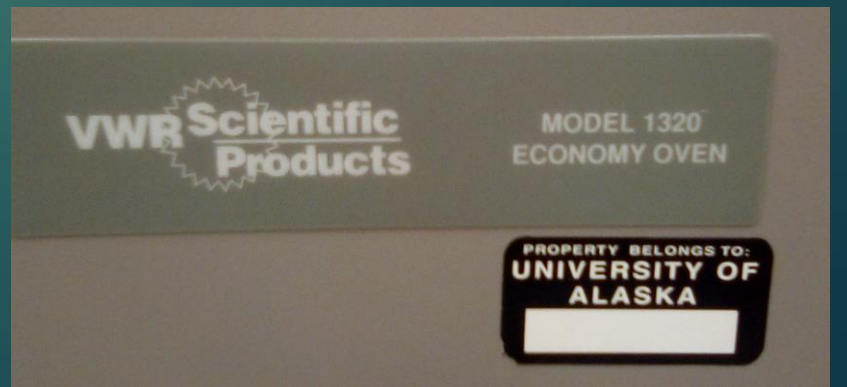
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Results

- Are similar declines of flying insects occurring in Alaska? - Not among mosquitoes in Fairbanks
- Correlating USGS data
- Decrease in mass at every weighing stage
- Slope analysis

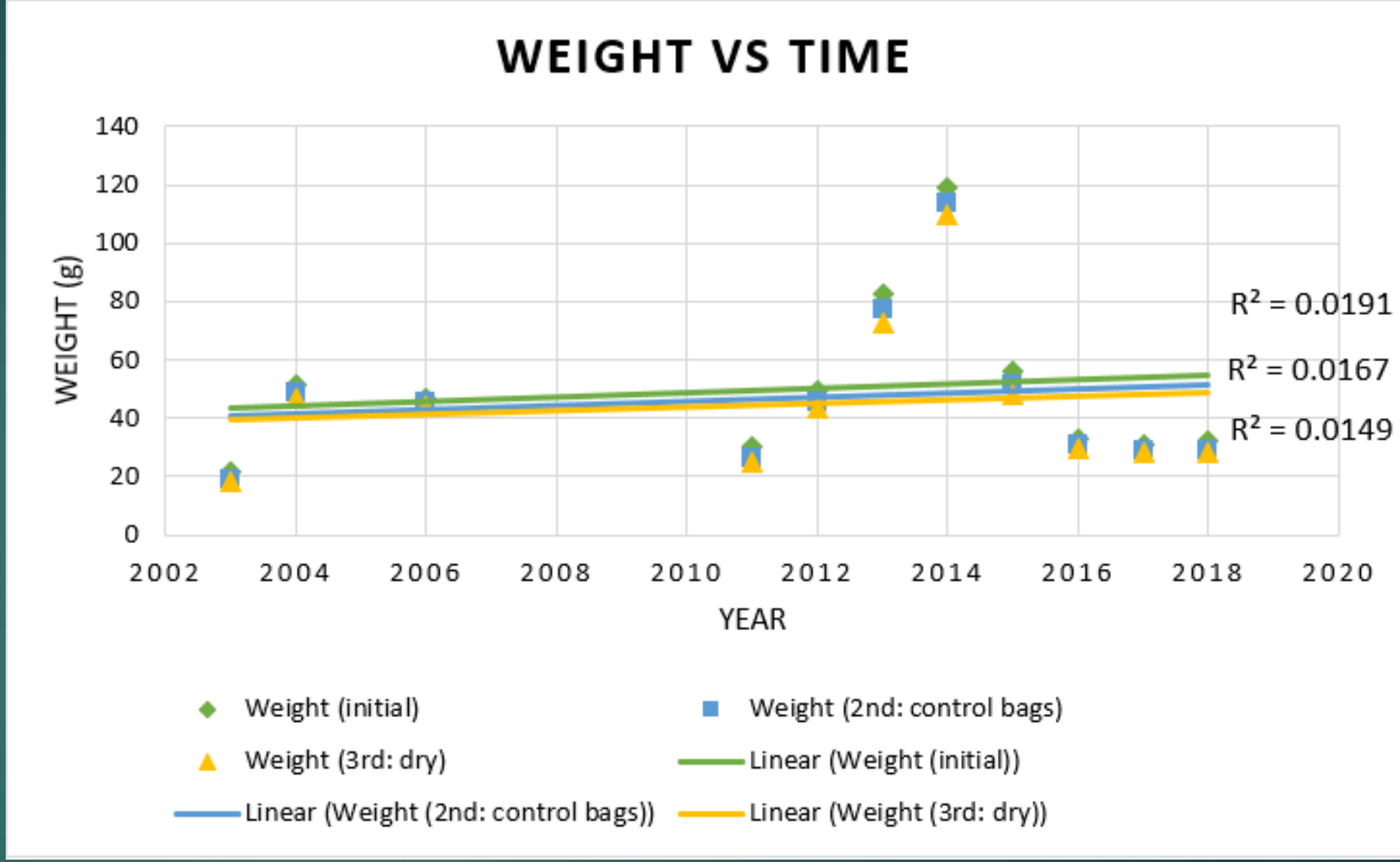


Figure 1. Weights of culicids through time. Symbols and colors indicate each recorded mass

Analysis of Variance Results

F-statistic value = NaN

P-value = 1

Groups	N	Mean
Group 1	1	0.7521
Group 2	1	0.6146
Group 3	1	0.6822

ANOVA Summary					
Source	Degrees of Freedom DF	Sum of Squares SS	Mean Square MS	F-Stat	P-Value
Between Groups	2	0.0095	0.0047	NaN	1

Table 2. Analysis of Slope Significance. Initial, control bags, and dry weights of Culicids indicated by Group 1, 2, and 3 respectively.

Results

- Methodological question: What's the best way to measure biomass?
- Standardized bags & dry weights
- No significant difference between weights and bags of stages

Analysis of Variance Results

F-statistic value = 0.10867

P-value = 0.89738

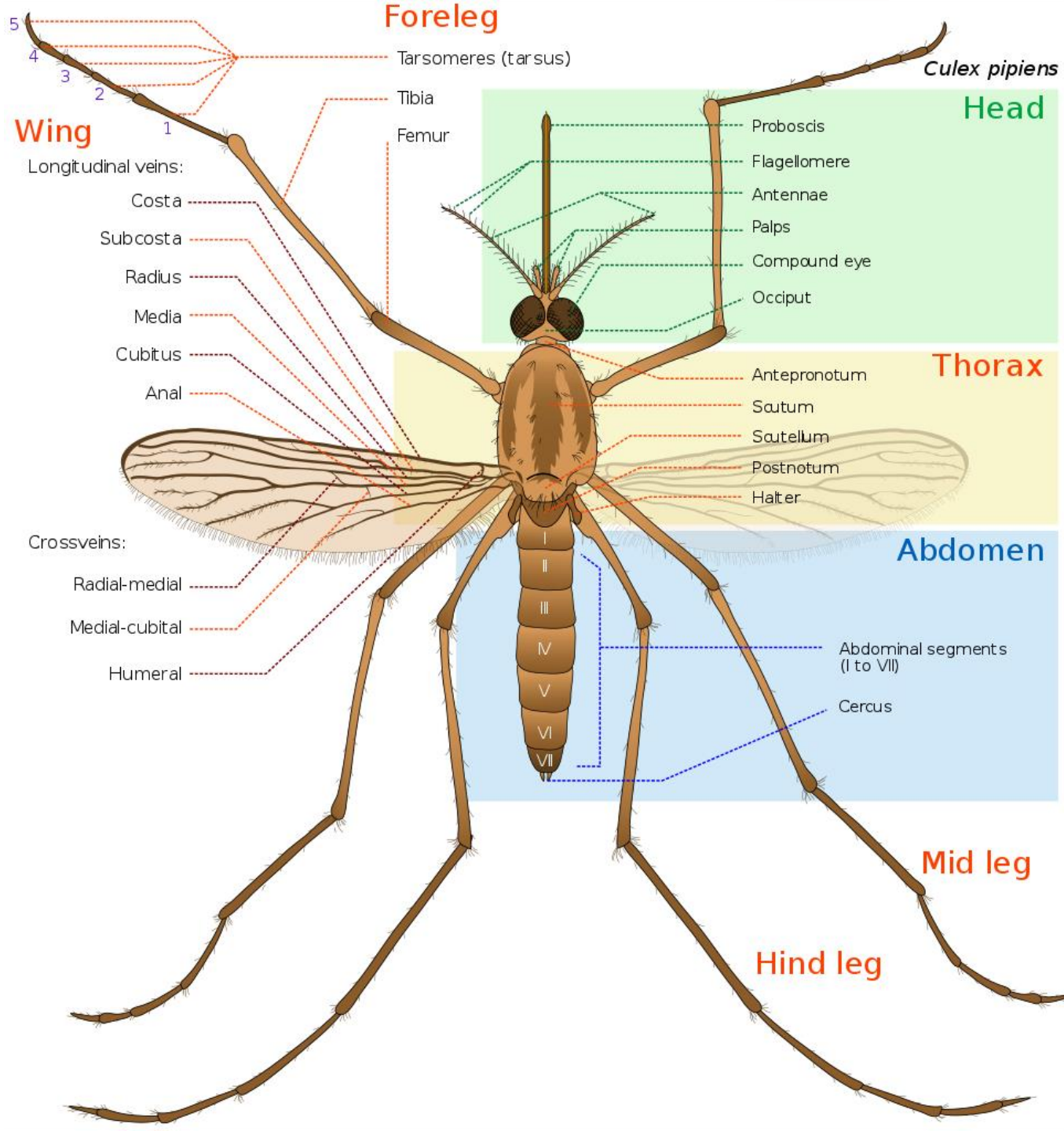
Data Summary				
Groups	N	Mean	Std. Dev.	Std. Error
Group 1	11	50.3218	28.3654	8.5525
Group 2	11	47.02	27.5487	8.3063
Group 3	11	44.9155	26.3013	7.9301

ANOVA Summary					
Source	Degrees of Freedom DF	Sum of Squares SS	Mean Square MS	F-Stat	P-Value
Between Groups	2	163.3826	81.6913	0.1087	0.8974
Within Groups	30	22552.8517	751.7617		
Total:	32	22716.2343			

Table 3. Initial, control bags, and dry weights of culicids indicated by Group 1, 2, and 3 respectively.

Discussion

- Trends appear to display a stable population of culicids in Fairbanks
- Long term study (15 yrs) but only 1 site and 1 trap
- Moth wings found in years 03 04 and 06
- No clear signs of decline between 03 - 18
- Need for more citizen science



Thank you!

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